

**In the Claims:**

1-22. (Canceled)

23. (Currently Amended) A method of modifying the electrophysiological function of ~~an excitable tissue region~~ a heart of an individual, the method comprising:

(a) providing cells expressing an exogenous polypeptide forming a functional ion channel ~~or transporter~~; and

(b) implanting said cells into ~~the excitable tissue region~~ the heart of the individual, such that each implanted cell forms of said cells:

(i) gap junctions with at least one cell of the ~~excitable tissue region~~ heart; and

(ii) a functional ion channel ~~or transporter~~;

thereby modifying the electrophysiological function of the ~~excitable tissue region~~ heart,

wherein expression of said exogenous polypeptide is regulatable by an endogenous or an exogenous factor and whereas the method is utilized for treating atrial fibrillation or ventricular tachycardia or for pacemaking.

24. (Currently Amended) The method of claim 23, wherein said ion channel is ~~selected from the group consisting of a sodium ion channel, a potassium ion channel, a calcium ion channel and a chloride ion channel.~~

25-27. (Canceled)

28. (Currently Amended) A method of modifying the electrophysiological function of ~~an excitable tissue region of~~ a heart of an individual, the method comprising:

(a) providing cells expressing an exogenous polypeptide forming a functional ion channel ~~or transporter~~; and

(b) implanting said cells into ~~the excitable tissue region~~ the heart of the individual, such that each implanted cell of said cells forms:

(i) gap junctions with at least one cell of the ~~excitable tissue-region~~ heart; and

(ii) a functional ion channel ~~or transporter~~;  
thereby modifying the electrophysiological function of ~~the excitable tissue-region~~ the heart,

wherein an ion permeability of said functional ion channel or an activity of said transporter is regulatable by an endogenous or an exogenous factor and whereas the method is utilized for treating atrial fibrillation or ventricular tachycardia or for creating a pacemaker.

29. (Currently Amended) A method of modifying the electrophysiological function of ~~an excitable tissue-region~~ a heart of an individual, the method comprising:

(a) providing cells expressing an exogenous polypeptide forming a functional ion channel ~~or transporter~~;

(b) implanting said cells into ~~the~~ the heart ~~excitable tissue-region of~~ the individual, such that each implanted cell of said cells forms:

(i) gap junctions with at least one cell of the ~~excitable tissue-region~~ heart; and

(ii) a functional ion channel ~~or transporter~~; and

(c) regulating permeability of said functional ion channel or an activity of said transporter to thereby regulate the electrophysiological function of the ~~excitable tissue-region~~ heart, wherein the method is utilized for treating atrial fibrillation or ventricular tachycardia or for creating a pacemaker.

30. (Currently Amended) The method of claim 29, wherein said regulating said permeability or said activity is effected by administering an exogenous factor to the ~~excitable tissue-region~~ heart.

31. (Currently Amended) The method of claim 23, wherein each implanted cell forms said functional ion channel ~~or transporter~~ following induction.

32. (Canceled)

33. (Currently Amended) A method of modifying the electrophysiological function of ~~an excitable tissue region~~ a heart of an individual, the method comprising:

(a) providing cells expressing an exogenous polypeptide forming a functional ion channel ~~or transporter~~; and

(b) implanting said cells into the ~~excitable tissue region~~ heart of the individual, such that each implanted cell of said cells forms:

(i) gap junctions with at least one cell of ~~the excitable tissue region~~ the heart; and

(ii) a functional ion channel ~~or transporter~~;

thereby modifying the electrophysiological function of the ~~excitable tissue region~~ heart,

wherein the method is utilized for ~~regulating cardiac arrhythmia~~ treating atrial fibrillation or ventricular tachycardia or for creating a pacemaker.

34. (Canceled)

35. (Currently Amended) A method of modifying the electrophysiological function of ~~an excitable~~ a neural tissue region of an individual, the method comprising:

(a) providing cells expressing an exogenous polypeptide forming a functional ion channel ~~or transporter~~; and

(b) implanting said cells into the ~~excitable~~ neural tissue region, such that each implanted cell of said cells forms:

(i) gap junctions with at least one cell of the ~~excitable~~ neural tissue region; and

(ii) a functional ion channel ~~or transporter~~;

thereby modifying the electrophysiological function of the ~~excitable~~ neural tissue region,

wherein the method is utilized for ~~regulating neuronal discharge~~ treating Parkinson's disease.

36-42. (Canceled)

43. (Currently Amended) The method of claim 28, wherein said ion channel is ~~selected from the group consisting of a sodium ion channel, a potassium ion channel, a calcium ion channel and a chloride ion channel.~~

44. (Currently Amended) The method of claim 28, wherein each implanted cell forms said functional ion channel ~~or transporter~~ following induction.

45-48. (Canceled)

49. (Currently Amended) The method of claim 29, wherein said ion channel is ~~selected from the group consisting of a sodium ion channel, a potassium ion channel, a calcium ion channel and a chloride ion channel.~~

50. (Currently Amended) The method of claim 29, wherein each implanted cell forms said functional ion channel ~~or transporter~~ following induction.

51-54. (Canceled)

55. (Currently Amended) The method of claim 33, wherein said ion channel is ~~selected from the group consisting of a sodium ion channel, a potassium ion channel, a calcium ion channel and a chloride ion channel.~~

56. (Currently Amended) The method of claim 33, wherein each implanted cell forms said functional ion channel ~~or transporter~~ following induction.

57-58. (Canceled)

59. (Currently Amended) The method of claim 35, wherein said ion channel is ~~selected from the group consisting of a sodium ion channel, a potassium ion channel, a calcium ion channel and a chloride ion channel.~~

60. (Currently Amended) The method of claim 35, wherein each implanted cell forms said functional ion channel ~~or transporter~~ following induction.

61-67. (Canceled)

68. (Currently Amended) The method of claim 23, wherein said implanted cells comprise fibroblasts.

69. (Currently Amended) The method of claim 28, wherein said implanted cells comprise fibroblasts.

70. (Currently Amended) The method of claim 29, wherein said implanted cells comprise fibroblasts.

71. (Currently Amended) The method of claim 33, wherein said implanted cells comprise fibroblasts.

72-83. (Canceled)

84. (New) A method of modifying the electrophysiological function of a neural tissue of an individual, the method comprising:

(a) providing cells expressing an exogenous polypeptide forming a functional ion channel; and

(b) implanting said cells into the neural tissue of the individual, such that each implanted cell of said cells forms:

(i) gap junctions with at least one cell of the neural tissue;

and

(ii) a functional ion channel;

thereby modifying the electrophysiological function of the neural tissue,

Wherein expression of said exogenous polypeptide is regulatable by an endogenous or an exogenous factor and whereas the method is utilized for treating Parkinson's diseases.

85. (New) The method of claim 84, wherein said implanted cells comprise fibroblasts.

86. (New) The method of claim 84, wherein said ion channel is a potassium ion channel.

87. (New) A method of modifying the electrophysiological function of a neural tissue of an individual, the method comprising:

(a) providing cells expressing an exogenous polypeptide forming a functional ion channel; and

(b) implanting said cells into the neural tissue of the individual, such that each implanted cell of said cells forms:

(i) gap junctions with at least one cell of the neural tissue; and

(ii) a functional ion channel; thereby modifying the electrophysiological function of the neural tissue,

wherein an ion permeability of said functional ion channel or an activity of said transporter is regulatable by an endogenous or an exogenous factor and whereas the method is utilized for treating Parkinson's disease.

88. (New) The method of claim 87, wherein said implanted cells comprise fibroblasts.

89. (New) The method of claim 87, wherein said ion channel is a potassium ion channel.

90. (New) A method of modifying the electrophysiological function of a neural tissue of an individual, the method comprising:

(a) providing cells expressing an exogenous polypeptide forming a functional ion channel; and

(b) implanting said cells into the neural tissue of the individual, such that each implanted cell of said cells forms:

(i) gap junctions with at least one cell of the neural tissue;  
and

(ii) a functional ion channel;  
thereby modifying the electrophysiological function of the neural tissue,  
wherein the method is utilized for treating Parkinson's disease.

91. (New) The method of claim 90, wherein said implanted cells comprise fibroblasts.

92. (New) The method of claim 90, wherein said ion channel is a potassium ion channel.

93. (New) The method of claim 92, wherein said potassium ion channel is Kv1.3 or Kir2.1.

94. (New) The method of claim 24, wherein said potassium ion channel is Kv1.3 or Kir2.1.

95. (New) The method of claim 43, wherein said potassium ion channel is Kv1.3 or Kir2.1.

96. (New) The method of claim 49, wherein said potassium ion channel is Kv1.3 or Kir2.1.

97. (New) The method of claim 55, wherein said potassium ion channel is Kv1.3 or Kir2.1.

98. (New) The method of claim 59, wherein said potassium ion channel is Kv1.3 or Kir2.1.

99. (New) The method of claim 86, wherein said potassium ion channel is Kv1.3 or Kir2.1.

100. (New) The method of claim 89, wherein said potassium ion channel is Kv1.3 or Kir2.1.